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of Transportation

**Federal Aviation
Administration**

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AVIATION MECHANIC AIRFRAME

Practical Test Standards

July 2012

**FLIGHT STANDARDS SERVICE
Washington, DC 20591**

**AVIATION MECHANIC
AIRFRAME
PRACTICAL TEST STANDARDS**

2012

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Washington, D.C. 20591**

NOTE

FAA-S-8081-27A, Aviation Mechanic Airframe Practical Test Standards (PTS) supersedes FAA-S-8081-27 dated June 2003.

This PTS will be effective November 1, 2012.

MAJOR ENHANCEMENTS

- Removed the core competency element requirements (objective 2) for each subject area.
- There are now only 2 objectives for each subject area:
 - Objective 1: Exhibits knowledge in oral elements.
 - Objective 2: Demonstrates skill to perform, practical elements.
- Added and/or revised elements within objective 2 to expand the selection of projects for the DME.
- Added new subject area "M" Human Factors/Maintenance Resource Management (MRM).
- Revised introduction to include International Civil Aviation Organization (ICAO) references to aircraft maintenance performance, eligibility, skill, knowledge, and experience requirements.
- Updated references to FAA orders, instructional materials, and inspector guidance.

FOREWORD

This Aviation Mechanic Airframe Practical Test Standards book has been published by the Federal Aviation Administration (FAA) to establish the standards for the Aviation Mechanic Airframe Practical Test. The passing of this practical test is a required step toward obtaining the Aviation Mechanic certificate with an Airframe rating. **FAA inspectors and Designated Mechanic Examiners (DMEs) shall conduct practical tests in compliance with these standards.** Applicants should find these standards helpful in practical test preparation.

/s/ 7/18/2012

Raymond Towles, for

John Allen, Director
Flight Standards Service

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INTRODUCTION

The Federal Aviation Administration (FAA) aircraft mechanic's oral and practical test(s) are outcome-based examinations. Before being issued any airframe and/or powerplant certificate, all applicants must demonstrate the minimum level of knowledge and skills for the certificate or rating sought.

Skill tests are significant as they measure the applicant's ability to logically think and objectively apply their knowledge, while demonstrating the physical skills that enable them to carry out aircraft maintenance in a professional and safe manner.

Satisfactory demonstration of each skill test is evidence the applicant meets the acceptable degree of competency for the certificate or rating sought.

This PTS is available for download, free of charge, at:

www.faa.gov

Comments regarding this PTS should be sent to:

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-OR-

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Practical Test Standard Concept

Title 49 U.S. Code, Subtitle VII, Chapter 447 is the foundation for the FAA's safety regulations, and provides flexibility through FAA Order 8900.2, General Aviation Airman Designee Handbook, to examine and issue an airman certificate. This order is policy and mandatory standardized procedures for those who administer all aviation mechanic oral and practical tests.

NOTE: A designee conducting an oral and/or practical test must not test more than one applicant at a time, unless authorized in accordance with FAA Order 8900.1, *Flight Standards Information Management System* and FAA Order 8900.2.

Definitions within:

- **Competency**—a combination of skills, knowledge, and attitudes required to perform a task to the prescribed standard.
- **Knowledge** (oral)—elements are indicated by use of the words "*Exhibits knowledge in....*"
- **Skill**—(practical) elements are indicated by the use of the words "*Demonstrates the skill to perform....*"

This practical test book is a variety of technical projects or tasks containing subject areas included in the FAA written knowledge test as the current minimum required curriculum, which is prescribed in Title 14 of the Code of Federal Regulations (14 CFR) part 147 appendices.

Compliance with these procedures makes certain that airman applicants meet a satisfactory level of competency and workmanship required for certification.

Every applicant is required to demonstrate a minimum satisfactorily competency level, regardless of their previous education background.

Adherence to the following standards is mandatory when evaluating an applicant's test performance for an FAA Airframe and/or Powerplant Certificate:

- International Civil Aviation Organization (ICAO) Annex 1: 4.2.1.5
- 14 CFR part 65, section 65.79
- FAA Order 8900.2

All applicants for a FAA aviation mechanic certificate must qualify by meeting the prescribed requirements as stated in 14 CFR part 65, section 65.77. They must additionally pass a written knowledge test, and the oral and practical tests for the certificate and/or rating sought, in accordance with the following standards:

- ICAO Annex 1: 4.2.1.3
- 14 CFR part 65, section 65.77

FAA written knowledge tests contain topics that include the construction and maintenance of aircraft, relevant FAA regulations, basic principles for installation and maintenance of propellers, and powerplants, depending on the certificate and rating sought, based on the following standards:

- ICAO Annex 1: 4.2.1.2
- 14 CFR part 65, section 65.75

Aviation maintenance instructors and applicants should find these standards helpful during training and preparing for the skill test, which are required under 14 CFR part 65, section 65.79.

Reference List

14 CFR part 1	Definitions and Abbreviations
14 CFR part 3	General Requirements
14 CFR part 21	Certification Procedures for Products and Parts
14 CFR part 39	Airworthiness Directives
14 CFR part 43	Maintenance, Preventive Maintenance Rebuilding and Alteration
14 CFR part 45	Identification and Registration Marking
14 CFR part 47	Aircraft Registration
14 CFR part 65	Certification: Airmen Other Than Flight Crewmembers
14 CFR part 91	Air Traffic and General Operating Rules
AC 20-62E	Eligibility, Quality, and Identification of Aeronautical Replacement Parts
AC 21-12B	Application for U.S. Airworthiness Certificate
AC 23-21	Airworthiness Compliance Checklist Used to Substantiate Major Alteration for Small Airplanes
AC 23.1309-1E	System Safety Analysis and Assessment for Part 23 Airplanes
AC 39-7C	Airworthiness Directives
AC 43.9C	Maintenance Records
AC 43.9-1F	Instructions for Completion of FAA Form 337

AC 43-206	Inspection, Prevention, Control and Repair or Corrosion on Avionics Equipment
AC 43-210	Standardized Procedures for Requesting Field Approval of Data, Major Alteration and Repairs
AC 43.13-1B	Acceptable Methods, Techniques and Practices A/C Inspection & Repair
AC 43.13-2B	Acceptable Methods, Techniques and Practices- Aircraft Alterations
FAA-H-8083-1	Aircraft Weight and Balance Handbook
FAA-H-8083-30	Aviation Maintenance Technician Handbook— General
FAA-H-8083-31	Aviation Maintenance Technician Handbook— Airframe
ICAO	International Civil Aviation Organization Annex 1, Personnel Licensing

Each subject area has an objective. The objective lists the important knowledge and skill elements that must be utilized by the examiner in planning and administering aviation mechanic tests, and that applicants must be prepared to satisfactorily perform.

EXAMINER is used in this standard to denote either the FAA Inspector or FAA Designated Mechanic Examiner (DME) who conducts the practical test.

Use of the Practical Test Standards

The FAA requires that all practical tests be conducted in accordance with the appropriate Aviation Mechanic Practical Test Standards and the policies and procedures set forth in the current revision of FAA Order 8900.2.

When using this practical test book, the examiner must evaluate the applicant's knowledge and skill in sufficient depth to determine that the objective for each subject area element selected is met. If the element selected in one subject area has already been evaluated in another area, they need not be repeated. For example the applicant need not be evaluated in SUBJECT AREA H. MATHEMATICS, ELEMENT **H10**. Add, subtract, multiply, and divide positive and negative numbers. (Level 3) if that ELEMENT was sufficiently observed during the completion of SUBJECT AREA C. WEIGHT AND BALANCE, ELEMENT **C4**. Compute forward and aft loaded c.g. (Level 3).

An applicant is not permitted to know before testing begins which selections in each subject area are to be included in his/her test. Therefore, an applicant should be well prepared in *all* oral and skill areas included in the practical test standard.

Further information and requirements for conducting a practical test is contained in FAA Order 8900.2.

Aviation Mechanic Practical Test Prerequisites

All applicants must have met the prescribed experience requirements as stated in 14 CFR part 65, section 65.77. (See FAA Order 8900.2 for information about testing under the provisions of 14 CFR part 65, section 65.80.)

Examiner Responsibility

All applicants must demonstrate an approval for return to service standard, where applicable and demonstrate the ability to locate and apply the required reference materials, where applicable. In instances where an approval for return to service standard cannot be achieved, the applicant must be able to explain why the return to service standard was not met (e.g., when tolerances are outside of a product's limitations).

The examiner must personally observe all practical projects performed by the applicant. The examiner who conducts the practical test is responsible for determining that the applicant meets acceptable standards of knowledge and skill in the assigned subject areas within the appropriate practical test standard. Since there is no formal division between the knowledge and skill portions of the practical test, this becomes an ongoing process throughout the test.

The following terms may be reviewed with the applicant prior to, or during, element assignment.

1. **Inspect**—means to examine by sight and/or touch (with or without inspection enhancing tools/equipment).
2. **Check**—means to verify proper operation.
3. **Troubleshoot**—means to analyze and identify malfunctions.
4. **Service**—means to perform functions that assure continued operation.
5. **Repair**—means to correct a defective condition. Repair of an airframe or powerplant system includes component replacement and adjustment, but not component repair.
6. **Overhaul**—means to disassemble, inspect, repair as necessary, and check.

Performance Levels

The following is a detailed description of the meaning of each level.

Level 1

- Know basic facts and principles.
- Be able to find information and follow directions and written instructions.
- Locate methods, procedures, instructions, and reference material.
- Interpretation of information not required.
- No skill demonstration is required.

Example:

Z3b. Locate specified nondestructive testing methods. (Level 1)

Performance Standard: The applicant will locate information for nondestructive testing.

Level 2

- Know and understand principles, theories, and concepts.
- Be able to find and interpret maintenance data and information, and perform basic operations using appropriate data, tools, and equipment.
- A high level of skill is not required.

Example:

Z3c. Detect electrical leakage in electrical connections, terminal strips, and cable harness (at least 10 will have leakage faults). (Level 2)

Performance Standard: Using appropriate maintenance data and a multimeter, the applicant will identify items with leakage faults.

Level 3 (This is the approval for return to service standards).

- Know, understand, and apply facts, principles, theories, and concepts.
- Understand how they relate to the total operation and maintenance of aircraft.
- Be able to make independent and accurate airworthiness judgments.
- Perform all skill operations to a return-to-service standard using appropriate data, tools, and equipment. Inspections are performed in accordance with acceptable or approved data.
- A fairly high skill level is required.

Example:

Z3e. Check control surface travel. (Level 3)

Performance Standard: Using type certificate data sheets and the manufacturer's service manual, the applicant will measure the control surface travel, compare the travel to the maintenance data, and determine if the travel is within limits.

Satisfactory Performance

The practical test is passed if the applicant demonstrates the prescribed proficiency in the assigned elements in each subject area to the required standard. Applicants shall not be expected to memorize all mathematical formulas that may be required in the performance of various elements in this practical test standard. However, where relevant, applicants must be able to locate and apply necessary formulas to obtain correct solutions.

Unsatisfactory Performance

If the applicant does not meet the standards of any of the elements performed (knowledge or skill elements), the associated subject area is failed, and thus the practical test is failed. The examiner or the applicant may discontinue testing any time after the failure of a subject area. In any case, the applicant is entitled to credit for only those subject areas satisfactorily completed. See the current revision of FAA Order 8900.2 for further information about retesting and allowable credit for subject areas satisfactorily completed.

Typical areas of unsatisfactory performance and grounds for disqualification include the following.

1. Any action or lack of action by the applicant that requires corrective intervention by the examiner for reasons of safety.
2. Failure to follow acceptable or approved maintenance procedures while performing skill (practical) projects.
3. Exceeding tolerances stated in the maintenance instructions.
4. Failure to recognize improper procedures.
5. The inability to perform to a return to service standard, where applicable.
6. Inadequate knowledge in any of the subject areas.

SECTION II—AIRFRAME STRUCTURES

A. WOOD STRUCTURES

REFERENCES: FAA-H-8083-31; AC 43-13 1B.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. inspection tools for wood structures.
 - b. inspection techniques and practices for wood structures.
 - c. effects of moisture/humidity on wood.
 - d. types and/or general characteristics of wood used in aircraft structures.
 - e. permissible substitutes and/or other materials used in the construction and repair of wood structures.
 - f. acceptable wood defects.
 - g. non-acceptable wood defects.
 - h. wood repair techniques and practices.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - A1. Locate substitute wood material chart. (Level 1)
 - A2. Inspect aircraft wood structure or wood sample. (Level 3)
 - A3. Locate procedures for selecting glue used for wood structure repairs. (Level 1)
 - A4. Locate repair standard dimensions. (Level 1)
 - A5. Inspect a wood repair for airworthiness. (Level 3)
 - A6. Locate repair procedures for elongated bolt holes. (Level 1)
 - A7. Identify protective finishes. (Level 2)
 - A8. Identify wood defects. (Level 2)
 - A9. Determine acceptable repairs or limits for one or more specific defects. (Level 2)
 - A10. List three types of wood used in aircraft structure. (Level 1)
 - A11. Identify and select aircraft quality/acceptable wood. (Level 2)
 - A12. Locate instructions for inspection of wood structures. (Level 1)
 - A13. Locate instructions for inspection of plywood structure and/or wood repairs. (Level 1)
 - A14. Locate wood spar and/or rib structure repair procedures. (Level 1)

B. AIRCRAFT COVERING

REFERENCES: FAA-H-8083-31; AC 43-13 1B.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. factors used in determining the proper type covering material.
 - b. types of approved aircraft covering material.
 - c. seams commonly used.
 - d. covering textile terms.
 - e. structure surface preparation.
 - f. covering methods commonly used.
 - g. covering means of attachment.
 - h. areas on aircraft covering most susceptible to deterioration.
 - i. aircraft covering preservation/restoration.
 - j. inspection of aircraft covering.
 - k. covering repair techniques and practices.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - B1.** Identify types of material used in aircraft covering. (Level 2)
 - B2.** Locate procedures for applying fabric. (Level 1)
 - B3.** Locate inspection requirements for fabric. (Level 1)
 - B4.** Locate repair instructions for fabric or fiberglass. (Level 1)
 - B5.** Locate test procedures for fabric. (Level 1)
 - B6.** Describe needed repairs for a damaged fabric. (Level 1)
 - B7.** Locate fabric critical areas. (Level 1)
 - B8.** Locate instructions for a hand-sewn fabric seam. (Level 1)
 - B9.** Locate instructions for repairing a sewn fabric tear. (Level 1)
 - B10.** Locate instructions for a splice lacing cord. (Level 1)
 - B11.** Locate instructions for tying a modified seine knot. (Level 1)
 - B12.** Locate instructions for the repair of a wing trailing edge fabric damage. (Level 1)
 - B13.** Determine the applicability of installing supplemental type certificate (STC) covering materials on a given aircraft. (Level 2)
 - B14.** Locate instructions for preparing a fabric sample for laboratory testing. (Level 1)
 - B15.** Locate the general requirements for making doped and lapped seams. (Level 1)
 - B16.** Locate instructions for the repair and replacement of fabric on a fabric-covered surface using screws, special fasteners, or mechanical methods. (Level 1)
 - B17.** Locate instructions for installing ventilation/drainage grommets on a fabric surface. (Level 1)
 - B18.** Determine the classification of a repair on a fabric-covered surface. (Level 2)

C. AIRCRAFT FINISHES

REFERENCES: FAA-H-8083-31; AC 43-13 1B; 14 CFR part 45.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. protection of airframe structures.
 - b. primer materials.
 - c. topcoat materials.
 - d. surface preparation for a desired finishing material.
 - e. effects of ambient conditions on finishing materials.
 - f. effects of improper surface preparation on finishing materials.
 - g. regulatory requirements for registration markings.
 - h. inspection of aircraft finishes.
 - i. safety practices/precautions when using finishing materials.
 - j. fungicidal, butyrate, and/or nitrate dopes.
 - k. finishing materials application techniques and practices.
 - l. where necessary, balance considerations after refinishing.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - C1.** Determine location and/or size requirements for aircraft registration numbers. (Level 2)
 - C2.** Prepare composite surface for painting. (Level 2)
 - C3.** Identify finishing materials and thinners. (Level 2)
 - C4.** Layout and mask an aircraft identification marking ("N" number). (Level 2)
 - C5.** Apply dope by brush to a fabric surface. (Level 2)
 - C6.** Apply dope with a spray gun. (Level 3)
 - C7.** Prepare metal surface for painting. (Level 2)
 - C8.** Spray paint metal surfaces. (Level 2)
 - C9.** Inspect doped fabric finish. (Level 2)
 - C10.** Inspect acrylic nitrocellulose lacquer finish. (Level 2)
 - C11.** Identify paint finish defects. (Level 2)
 - C12.** Determine what paint system can be used on a given aircraft. (Level 2)
 - C13.** Apply etch solution and conversion coating. (Level 2)
 - C14.** Determine if control surfaces require rebalancing. (Level 2)
 - C15.** Identify types of protective finishes. (Level 2)

D. SHEET METAL AND NON-METALLIC STRUCTURES

REFERENCES: FAA-H-8083-31; AC 43-13 1B.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. inspection/testing of sheet metal structures.
 - b. types of sheet metal defects.
 - c. selection of sheet metal.
 - d. layout, and/or forming of sheet metal.
 - e. selection of rivets.
 - f. rivet layout.
 - g. rivet installation.
 - h. inspection/testing of composite structures.
 - i. types of composite structure defects.
 - j. composite structure fiber, core, and/or matrix materials.
 - k. composite materials storage practices and shelf life.
 - l. composite structure repair methods, techniques, and practices.
 - m. window inspection/types of defects.
 - n. window material storage and handling.
 - o. window installation procedures.
 - p. care and maintenance of windows.
 - q. window temporary and/or permanent repairs.
 - r. maintenance safety practices/precautions for sheet metal, and/or composite materials/structures, and/or windows.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - D1.** Prepare and install a patch for damage to an aircraft or component. (Level 3)
 - D2.** Make a drawing of a repair and determine the number of rivets and size required for the repair. (Level 3)
 - D3.** Remove a patch that was installed with rivets. (Level 3)
 - D4.** Trim and form a piece of sheet metal to fit into a prepared area. (Level 3)
 - D5.** Fabricate a complex aluminum part in accordance with a drawing. (Level 3)
 - D6.** Determine a rivet pattern for a specific repair given pitch, gauge, and edge distance. (Level 2)
 - D7.** Install special fasteners of at least 2 different types. (Level 2)

- D8.** Perform metallic ring test on bonded structure. (Level 2)
- D9.** Countersink holes in sheet metal to .010 tolerance. (Level 2)
- D10.** Inspect composite, plastic, or glass-laminated structures.
(Level 3)
- D11.** Inspect acrylic type windshields. (Level 3)
- D12.** Identify window enclosure materials. (Level 2)
- D13.** Inspect pilot seat and seatbelt to include technical standard
order (TSO) markings. (Level 3)
- D14.** Perform a repair on a damaged aluminum sheet. (Level 3)

E. WELDING

REFERENCES: FAA-H-8083-31; AC 43-13 1B.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. flame welding gasses.
 - b. storage/handling of welding gasses.
 - c. flame welding practices and techniques.
 - d. inert-gas welding practices and techniques.
 - e. purpose and types of shielding gasses.
 - f. characteristics of acceptable welds.
 - g. characteristics of unacceptable welds.
 - h. types of steel tubing welding repairs.
 - i. procedures for weld repairs.
 - j. soldering preparation, types of solder, and/or flux usage.
 - k. welding and/or soldering safety practices/precautions.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - E1.** Solder aircraft wire and connectors. (Level 2)
 - E2.** Select torch tips. (Level 2)
 - E3.** Select welding rods. (Level 2)
 - E4.** Adjust oxyacetylene flame to neutral appearance. (Level 2)
 - E5.** Perform a silver solder joint. (Level 2)
 - E6.** Braze a lap joint. (Level 2)
 - E7.** Locate the method of cleaning magnesium in preparation for welding. (Level 1)
 - E8.** Fabricate a weld patch (diamond patch). (Level 2)
 - E9.** Perform oxyacetylene butt welds. (Level 2)
 - E10.** Demonstrate electric arc welding. (Level 2)
 - E11.** Select repair procedure for tubular structure. (Level 1)
 - E12.** Inspect and check welds. (Level 2)

F. ASSEMBLY AND RIGGING

REFERENCES: FAA-H-8083-31; AC 43-13 1B.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. control cable.
 - b. control cable maintenance.
 - c. cable connectors.
 - d. cable guides.
 - e. control stops.
 - f. push pull tubes.
 - g. torque tubes.
 - h. bell cranks.
 - i. flutter and flight control balance.
 - j. rigging of airplane or rotorcraft flight controls.
 - k. airplane or rotorcraft flight controls and/or stabilizer systems.
 - l. types of rotorcraft rotor systems.
 - m. rotor vibrations.
 - n. rotor blade tracking.
 - o. aircraft jacking procedures.
 - p. jacking safety practices/precautions.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - F1.** Locate the procedures needed to rig a helicopter. (Level 1)
 - F2.** Locate causes of vertical vibration in a two blade helicopter rotor system. (Level 1)
 - F3.** Locate helicopter rotor blade tracking procedures. (Level 1)
 - F4.** Identify fixed-wing aircraft rigging adjustment locations. (Level 2)
 - F6.** Identify control surfaces that provide movement about an aircraft's axes. (Level 2)
 - F7.** Locate leveling methods and procedures. (Level 1)
 - F8.** Verify alignment of an empennage. (Level 3)
 - F9.** Verify alignment of landing gear. (Level 3)
 - F10.** Inspect a primary and secondary flight control surface. (Level 3)
 - F11.** Remove and/or reinstall a primary flight control surface. (Level 3)
 - F12.** Assemble aircraft components. (Level 3)
 - F13.** Inspect primary control cables. (Level 3)
 - F14.** Install swaged cable terminals. (Level 3)
 - F15.** Remove and reinstall a primary flight control cable. (Level 3)
 - F16.** Adjust push-pull flight control systems. (Level 3)
 - F17.** Balance a flight control surface. (Level 3)
 - F18.** Locate jacking procedures. (Level 1)
 - F19.** Locate jacking points. (Level 1)

G. AIRFRAME INSPECTION

REFERENCES: FAA-H-8083-31; AC 43-13 1B.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. one or more required inspections under 14 CFR part 91.
 - b. maintenance requirements under 14 CFR part 43.
 - c. inspection requirements under 14 CFR part 43.
 - d. requirements for complying with airworthiness directives.
 - e. compliance with service letters, instructions for continued airworthiness, and/or bulletins.
 - f. maintenance record requirements under 14 CFR part 43.
 - g. maintenance record requirements under 14 CFR part 91.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - G1.** Check a given aircraft for airworthiness directive compliance. (Level 3)
 - G2.** Perform a portion of a 100-hour/annual inspection in accordance with Part 43, Appendix D. (Level 3)
 - G3.** Enter results of a 100-hour inspection in maintenance records. (Level 3)
 - G4.** Perform a portion of the conformity inspection on an engine, airframe, or propeller. (Level 3)
 - G5.** Determine when the next annual and/or 100-hour inspection is required on a specific aircraft. (Level 2)
 - G6.** Determine if a particular repetitive airworthiness directive has been accomplished. (Level 3)
 - G7.** Provide a checklist for conducting a 100-hour inspection. (Level 2)

SECTION III—AIRFRAME SYSTEMS AND COMPONENTS

K. AIRCRAFT LANDING GEAR SYSTEMS

REFERENCES: FAA-H-8083-31; AC 43-13 1B.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. landing gear strut servicing/lubrication.
 - b. landing gear steering systems.
 - c. landing gear retraction/extension systems.
 - d. landing gear inspection.
 - e. brake assembly inspection.
 - f. wheel and tire construction
 - g. tire mounting.
 - h. wheel and tire inspection.
 - i. wheel bearing inspection.
 - j. tire storage, care, and/or servicing.
 - k. landing gear and/or tire and wheel safety practices/precautions.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - K1. Service landing gear air/oil shock strut. (Level 3)
 - K2. Bleed air from a hydraulic brake system. (Level 3)
 - K3. Troubleshoot hydraulic brake systems. (Level 3)
 - K4. Remove, inspect, service, and/or reinstall a wheel assembly. (Level 3)
 - K5. Demount, inspect, and/or reinstall a tire on a wheel. (Level 3)
 - K6. Remove, inspect, and/or install a wheel brake assembly. (Level 3)
 - K7. Inspect a tire for defects. (Level 3)
 - K8. Repair a defective tube. (Level 3)
 - K9. Locate tire storage practices. (Level 1)
 - K10. Replace a tire or tube valve core and inspect for leaks. (Level 3)
 - K11. Remove and replace brake linings. (Level 3)
 - K12. Replace air/oil shock strut air valve. (Level 3)
 - K13. Troubleshoot an air/oil shock strut. (Level 3)
 - K14. Service a nosewheel shimmy damper. (Level 3)
 - K15. Adjust nosewheel steering system. (Level 3)
 - K16. Inspect landing gear alignment. (Level 3)
 - K17. Replace master brake cylinder packing seals. (Level 3)
 - K18. Troubleshoot landing gear retract system. (Level 3)
 - K19. Troubleshoot aircraft steering system. (Level 3)
 - K20. Inspect a brake for serviceability. (Level 3)

L. HYDRAULIC AND PNEUMATIC POWER SYSTEMS

REFERENCES: FAA-H-8083-31; AC 43-13 1B.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. hydraulic and/or pneumatic system, and/or system component(s) function/operation.
 - b. servicing, function, and/or operation of accumulators.
 - c. types of hydraulic/pneumatic seals and/or fluid/seal compatibility.
 - d. hydraulic/pneumatic seal maintenance procedures.
 - e. types of hydraulic/pneumatic filters and/or filter operation.
 - f. filter maintenance procedures.
 - g. pressure regulators and valves.
 - h. servicing hydraulic and/or pneumatic systems.
 - i. types/identification and/or characteristics of various hydraulics fluids used in aircraft.
 - j. hydraulic/pneumatic system safety practices/precautions.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - L1.** Identify different types of hydraulic fluids. (Level 2)
 - L2.** Identify different packing seals. (Level 2)
 - L3.** Install seals in a hydraulic component. (Level 3)
 - L4.** Remove and install a selector valve. (Level 3)
 - L5.** Check a pressure regulator and adjust as necessary. (Level 3)
 - L6.** Remove, clean, and install a hydraulic system filter. (Level 3)
 - L7.** Service a hydraulic system accumulator. (Level 3)
 - L8.** Service a hydraulic system reservoir. (Level 3)
 - L9.** Remove, install, and check an engine-driven hydraulic pump. (Level 3)
 - L10.** Troubleshoot hydraulic power system. (Level 3)
 - L11.** Purge air from a hydraulic system. (Level 3)
 - L12.** Remove and/or install a system pressure relief valve. (Level 3)
 - L13.** Troubleshoot a hydraulic power system leak. (Level 3)
 - L14.** Troubleshoot a pneumatic power system leak. (Level 3)
 - L15.** Service pneumatic brake system air bottles. (Level 3)
 - L16.** Inspect a pneumatic air bottle for condition and determine service life (hydrostatic testing). (Level 2)
 - L18.** Adjust a pneumatic power system relief valve. (Level 3)
 - L19.** Locate fluid servicing instructions and identify/select fluid for a given aircraft. (Level 2)

M. CABIN ATMOSPHERE CONTROL SYSTEMS

REFERENCES: FAA-H-8083-31; AC 43-13 1B.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. exhaust heat exchanger and/or system component(s) function, operation, and/or inspection procedures.
 - b. combustion heater and/or system component(s) function, operation, and/or inspection procedures.
 - c. vapor-cycle system and/or system component(s) operation, servicing and/or inspection procedures.
 - d. air-cycle system and/or system component(s) operation and/or inspection procedures.
 - e. cabin pressurization and/or system component(s) operation and/or inspection procedures.
 - f. types of oxygen systems and/or oxygen system component(s) operation.
 - g. oxygen system maintenance procedures.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - M1.** Locate procedures for troubleshooting a non-operational surface combustion heater. (Level 1)
 - M2.** Locate the procedures for protecting a freon system from contamination during replacement of a component. (Level 1)
 - M3.** Locate sources of contamination in a freon system. (Level 1)
 - M4.** Locate the procedures for checking a combustion heater fuel system for leaks. (Level 1)
 - M5.** Identify and describe the units in a freon system in relation to each other. (Level 2)
 - M6.** Locate the servicing procedures for a vapor-cycle air conditioning system. (Level 1)
 - M7.** Locate the inspection requirements for a cabin heater system equipped with an exhaust heat exchanger. (Level 1)
 - M8.** Locate the procedures for inspecting an outflow valve in a pressurization system. (Level 1)
 - M9.** Locate operating instructions for a freon system. (Level 1)
 - M10.** Locate the negative pressure relief valve. (Level 1)
 - M11.** Check an oxygen system for leaks. (Level 2)
 - M12.** Inspect an oxygen system. (Level 2)
 - M13.** Service an oxygen system. (Level 2)
 - M14.** Locate troubleshooting procedures for an oxygen system. (Level 1)
 - M15.** Locate instructions for the inspection of a pressurization system. (Level 1)

N. AIRCRAFT INSTRUMENT SYSTEMS

REFERENCES: FAA-H-8083-31; AC 43-13 1B.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. magnetic compass operation.
 - b. magnetic compass swinging procedures.
 - c. gyroscopic instrument(s) purpose and operation.
 - d. vacuum/pressure and/or electrically operated instrument system operation.
 - e. vacuum/pressure and/or electricity operated instrument system maintenance procedures.
 - f. pitot and/or static instruments purpose and operation.
 - g. pitot and/or static system operation.
 - h. 14 CFR parts 43 and/or 91 requirements for static system checks.
 - i. aircraft instrument range markings.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - N1.** Remove and install instruments. (Level 3)
 - N2.** Install range marks on an instrument glass. (Level 3)
 - N3.** Determine barometric pressure using an altimeter. (Level 2)
 - N4.** Check pitot-static heat for proper operation. (Level 2)
 - N5.** Check for proper indication of a manifold pressure gage. (Level 2)
 - N6.** Perform a pitot-static system leak test. (Level 2)
 - N7.** Apply instrument glass slippage marks. (Level 2)
 - N8.** Locate instructions for the inspection of a magnetic compass. (Level 1)
 - N9.** Locate procedures for troubleshooting a vacuum operated turn-and-bank instruments. (Level 1)
 - N10.** Identify an electric attitude indicator. (Level 2)
 - N11.** Select proper altimeter for installation on a given aircraft. (Level 2)
 - N12.** Locate a synchro-type indicating system. (Level 2)
 - N13.** Locate a vacuum pump. (Level 2)
 - N14.** Remove and install a heated pitot tube. (Level 3)
 - N15.** Identify exhaust gas temperature system components. (Level 2)

- N16.** Explain the troubleshooting procedures for an electrical resistance thermometer system. (Level 2)
- N17.** Service a vacuum system filter. (Level 2)
- N18.** Check an altimeter system for certification for instrument flight rules (IFR). (Level 2)
- N19.** Identify an aircraft vacuum system. (Level 2)
- N20.** Adjust gyro/instrument air pressure. (Level 2)
- N21.** Inspect a cylinder head temperature indicating system. (Level 2)
- N22.** Locate and explain troubleshooting procedures for a directional gyro system malfunction. (Level 2)
- N23.** Locate the alternate air source on an aircraft. (Level 2)

O. COMMUNICATION AND NAVIGATION SYSTEMS

REFERENCES: FAA-H-8083-31; AC 43-13 1B; 14 CFR part 91.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. 14 CFR part 91 emergency locator transmitter (ELT) maintenance requirements.
 - b. 14 CFR part 91 ELT record keeping requirements.
 - c. checking/inspecting coaxial cable.
 - d. coaxial cable installation and/or routing requirements.
 - e. communication and/or navigation systems commonly used.
 - f. proper installation of a com/nav radio in an existing radio rack.
 - g. means of identification of commonly used communication and/or navigation antennas.
 - h. autopilot system basic components and/or sensing elements.
 - i. static discharger function and operation.
 - j. static discharger maintenance procedures.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - O1.** Locate operating instructions for an autopilot system. (Level 1)
 - O2.** Locate autopilot inspection procedures. (Level 1)
 - O3.** List autopilot major components. (Level 2)
 - O4.** Locate and identify navigation and/or communication antennas. (Level 2)
 - O5.** Check very high frequency (VHF) communications for operation. (Level 2)
 - O6.** Inspect a coaxial cable installation for security. (Level 3)
 - O7.** Check an emergency locator transmitter for operation. (Level 2)
 - O8.** Inspect ELT batteries for expiration date. (Level 2)
 - O9.** Inspect electronic equipment mounting base for security and condition. (Level 2)
 - O10.** Inspect electronic equipment shock mount bonding jumpers for resistance. (Level 2)
 - O11.** Inspect static discharge wicks for security and/or resistance. (Level 2)
 - O12.** Inspect a radio installation for security. (Level 2)
 - O13.** Locate weather radar operating procedures. (Level 1)
 - O14.** Identify transponder transmission line. (Level 2)
 - O15.** Locate installation procedures for antennas including mounting and coaxial connections. (Level 1)
 - O16.** Make a list of required placards for communication and navigation avionic equipment. (Level 2)

P. AIRCRAFT FUEL SYSTEMS

REFERENCES: FAA-H-8083-31; AC 43-13 1B.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. fuel system strainer servicing.
 - b. construction characteristics of one or more types of fuel tanks.
 - c. fuel tank maintenance procedures.
 - d. fuel line routing/installation requirements.
 - e. hazards associated with fuel system maintenance.
 - f. types, characteristics, and/or operation of fuel systems and/or components thereof.
 - g. characteristics, and/or operation of fuel jettison systems and/or components thereof.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - P1.** Inspect a metal fuel tank. (Level 3)
 - P2.** Inspect a bladder fuel tank. (Level 3)
 - P3.** Inspect an integral fuel tank. (Level 3)
 - P4.** Check manually operated fuel valves for proper operation and/or leaks. (Level 3)
 - P5.** Troubleshoot a fuel valve problem. (Level 3)
 - P6.** Drain fuel system sumps. (Level 3)
 - P7.** Service a fuel system strainer. (Level 3)
 - P8.** Locate instructions for the calibration of a direct reading fuel indicating system. (Level 1)
 - P9.** Inspect a remote indicating fuel quantity system. (Level 2)
 - P10.** Locate fuel system operating instructions. (Level 1)
 - P11.** Locate fuel system inspection procedures. (Level 1)
 - P12.** Locate fuel system crossfeed procedures. (Level 1)
 - P13.** Locate fuel system required placards. (Level 2)
 - P14.** Locate fuel system defueling procedures. (Level 1)
 - P15.** Troubleshoot fuel pressure warning system. (Level 3)
 - P16.** Locate troubleshooting procedures for fuel temperature systems. (Level 1)
 - P17.** Remove and/or install a fuel quantity transmitter. (Level 3)
 - P18.** Troubleshoot aircraft fuel systems. (Level 3)
 - P19.** Remove and install a fuel selector valve. (Level 3)

Q. AIRCRAFT ELECTRICAL SYSTEMS

REFERENCES: FAA-H-8083-31; AC 43-13 1B.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. factors to consider when selecting wire size for an aircraft circuit.
 - b. routing and/or installation of electric wire or wire bundles.
 - c. wire splicing.
 - d. use of derating factors in switch selection.
 - e. requirements for circuit protection devices.
 - f. voltage regulator—purpose and operating characteristics.
 - g. lighting and/or lighting system components.
 - h. electric motor operation and/or motor components.
 - i. constant speed drive (CSD) and/or integrated drive generator (IDG) systems and/or system components.
 - j. airframe electrical system components.
 - k. wiring defects and/or inspection.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - Q1.** Select and install the appropriate type of wiring in a given electrical circuit. (Level 3)
 - Q2.** Select and install the appropriate type of electrical switches in a given circuit. (Level 3)
 - Q3.** Secure wire bundles. (Level 3)
 - Q4.** Select and install fuses and/or circuit protectors in a given aircraft electrical system. (Level 3)
 - Q5.** Determine an electrical load in a given aircraft system. (Level 3)
 - Q6.** Install bonding jumpers. (Level 3)
 - Q7.** Splice electrical wire. (Level 3)
 - Q8.** Check output voltage of a direct current (DC) generator. (Level 3)
 - Q9.** Adjust voltage regulators. (Level 3)
 - Q10.** Troubleshoot an electrical circuit with an open or short. (Level 3)
 - Q11.** Check the resistance of an electrical system component. (Level 2)
 - Q12.** Check generator brush spring tension and/or service ability. (Level 2)

- Q13.** Inspect and check anti-collision, position, and/or landing lights for proper operation. (Level 3)
- Q14.** Identify components in an electrical system. (Level 2)
- Q15.** Identify cockpit lighting circuits. (Level 2)
- Q16.** Troubleshoot a DC electrical system supplied by an alternating current (AC) electrical system. (Level 3)
- Q17.** Identify components in an electrical schematic where AC is rectified to a DC voltage. (Level 2)
- Q18.** Visually identify and describe operation of components in a constant speed drive (CSD) or integrated drive generator (IDG). (Level 2)

R. POSITION AND WARNING SYSTEM

REFERENCES: FAA-H-8083-31; AC 43-13 1B.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. anti-skid system basic components.
 - b. anti-skid system operating characteristics.
 - c. takeoff warning system basic components.
 - d. takeoff warning system function and operation.
 - e. control-surface trim indicating system basic components and/or operating characteristics.
 - f. landing gear position indicators.
 - g. flap position indicators.
 - h. landing gear warning system basic components and/or operating characteristics.
 - i. checking and/or repairing a landing gear warning system.
 - j. types of stall warning/lift detector systems and/or operating characteristics.
 - k. common annunciator system indications.
 - l. mach warning system indicator(s) and/or operating characteristics.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - R1.** Identify landing gear position system components. (Level 2)
 - R2.** Troubleshoot landing gear position and/or warning systems. (Level 3)
 - R3.** Identify landing gear warning system components. (Level 2)
 - R4.** Locate procedures for checking operation of an anti-skid warning system. (Level 1)
 - R5.** Locate troubleshooting procedures for an anti-skid system. (Level 1)
 - R6.** Locate troubleshooting procedures for a takeoff warning system. (Level 1)
 - R7.** Inspect landing gear position indicating system. (Level 3)
 - R8.** Repair landing gear position indicating systems. (Level 3)
 - R9.** Describe the sequence of operation for a landing gear warning system. (Level 2)
 - R10.** Determine the adjustment requirements of a flap position warning system. (Level 2)

- R11.** Locate the adjustment procedures for a stall warning system. (Level 1)
- R12.** Remove, install, and/or adjust a landing gear down-lock switch. (Level 3)
- R13.** Check rigging and adjustment of landing gear up-lock. (Level 3)
- R14.** Locate procedures for checking pneumatic/bleed air overheat warning systems. (Level 1)
- R15.** Inspect an electrical brake control for proper operation. (Level 3)

S. ICE AND RAIN CONTROL SYSTEMS

REFERENCES: FAA-H-8083-31; AC 43-13 1B.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. aircraft icing causes/effects.
 - b. ice detection systems.
 - c. anti-ice and/or deice areas.
 - d. anti-ice and/or deice methods commonly used.
 - e. checking and/or troubleshooting a pitot-static anti-ice system.
 - f. anti-icing and/or de-icing system components/operation.
 - g. anti-icing and/or de-icing system maintenance.
 - h. types of rain removal systems and/or operating characteristics.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - S1.** Inspect a pneumatic deicer boot. (Level 3)
 - S2.** Perform operational check of pneumatic deicer boot system to determine sequence and timing. (Level 2)
 - S3.** Clean a pneumatic deicer boot. (Level 2)
 - S4.** Check an electrically-heated pitot tube system. (Level 2)
 - S5.** Locate procedures for troubleshooting an electrically-heated pitot system. (Level 1)
 - S6.** Check an electrically heated water drain system. (Level 2)
 - S7.** Inspect thermal anti-ice systems. (Level 2)
 - S8.** Check an electrically-heated windshield. (Level 2)
 - S9.** Inspect an electrically-operated windshield wiper system. (Level 2)
 - S10.** Check an electrically or hydraulically-operated windshield wiper system. (Level 2)
 - S11.** Replace blades on a windshield wiper system. (Level 2)
 - S12.** Check pneumatic rain removal system. (Level 2)
 - S13.** Check a rain repellent system. (Level 2)
 - S14.** Locate inspection procedures for chemical rain protection of a windscreen. (Level 1)

T. FIRE PROTECTION SYSTEMS

REFERENCES: FAA-H-8083-31; AC 43-13 1B.

Objective. To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
 - a. fire and/or smoke detection system(s) or system components.
 - b. fire extinguishing system(s) and/or system components.
 - c. fire and/or smoke detection system operating characteristics.
 - d. fire extinguishing system operating characteristics.
 - e. determining proper container pressure for an installed fire extinguisher system.
 - f. maintenance procedures for fire detection and/or extinguishing system(s) and/or system component(s).
 - g. inspecting and/or checking a fire detection/overheat system.
 - h. inspecting and/or checking a smoke and/or toxic gas detection system.
 - i. troubleshooting a fire detection and/or extinguishing system.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
 - T1.** Locate inspection procedures for carbon monoxide detectors. (Level 1)
 - T2.** Locate procedures for checking a smoke detection system. (Level 1)
 - T3.** Locate the procedures for inspecting a thermal switch fire detection system. (Level 1)
 - T4.** Inspect, check, troubleshoot, and/or repair a fire detection system. (Level 3)
 - T5.** Inspect a thermocouple fire warning system. (Level 1)
 - T6.** Check a continuous loop fire detection system. (Level 3)
 - T7.** Inspect a continuous loop fire detection system. (Level 2)
 - T8.** Inspect fire protection system CO2 cylinders. (Level 2)
 - T9.** Inspect conventional CO2 fire protection system. (Level 3)
 - T10.** Check a conventional CO2 fire-protection systems. (Level 2)
 - T11.** Check a fire protection system freon bottle charge pressure. (Level 3)
 - T12.** Inspect a high-rate-of-discharge fire-extinguisher system. (Level 2)
 - T13.** Locate troubleshooting procedures for a high-rate-of-discharge fire-extinguisher system. (Level 1)
 - T14.** Inspect Freon bottle discharge cartridge. (Level 3)
 - T15.** Check Freon bottle discharge circuit. (Level 2)
 - T16.** Inspect fire-extinguisher bottle or cylinder for hydrostatic test date. (Level 3)